

REMARKS

The present claims relate to liquid crystal displays.

Applicant wishes to thank Examiners Briggs and Schechter for taking the time to hold a productive Interview with Applicant's representatives on January 3, 2006. It is greatly appreciated that the Examiners took the time to discuss the subject matter of the present invention with Applicant's representatives, and Applicant has considered the discussion during the Interview in preparing this Amendment.

Status of the claims

In the Office Action of September 11, 2006, claims 1-3, 11-13, and 20 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Okabe et al. (U.S. Patent No. 6,280,799) (hereinafter "Okabe"). Claims 7 and 10 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Sakamoto et al. (U.S. Publication No. 2002/0067452) (hereinafter "Sakamoto"). In addition, claims 4-6 and 14-19 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hirose et al (U.S. Patent No. 6,501,527) (hereinafter "Hirose") in view of Okabe. Claim 8 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Sakamoto in view of Hirose. Finally, claim 9 was rejected under 35 U.S.C. §

103(a) as allegedly being unpatentable over Sakamoto in view of Hirose, and further in view of Furukawa et al. (U.S. Patent No. 6,392,736) (hereinafter “Furukawa”).

Amendment summary

Upon entry of this Amendment, claims 1-20 will be pending.

Claim 1 is amended to clarify that D_2 refers to the outside diameter of an area which the adhering spacer particles, remaining after said dispersion of spacer particles is evaporated, adhere to. Support for this amendment is found on, e.g., page 11, lines 21-29 of the specification. In addition, claim 1 is amended to make clear that the Equation listed therein lies within the claim sentence and also to remove an extraneous “the” from the claim.

Claim 7 is reworded to more clearly delineate the already-claimed subject matter of claim 7.

Claim 11 is amended to recite that the vinyl-based thermoplastic resin therein is formed by free radical polymerizing vinyl-based monomers having a hydrophilic functional group or by free radical polymerizing vinyl-based monomers having a hydrophilic functional group with vinyl-based monomers having an alkyl group having 3 to 22 carbon atoms. Support for this amendment is found, e.g., in the paragraph bridging pages 9-10 of the specification. Claim 11 is

also amended to clarify that the dispersed “single particle” as it is used in the claim refers to dispersed “individual particles,” which was clear from the context of the original claim and the description on, e.g., page 20, lines 9-15 of the specification.

No new matter is added by this Amendment, and Applicant respectfully submits that entry of this Amendment is proper.

Response to objection to the title

In response to the objection to the title, Applicant respectfully submits that the title is clearly indicative of the claims. Applicant respectfully requests that if the Examiner disagrees after reviewing the claims, that the Examiner suggest a suitable title.

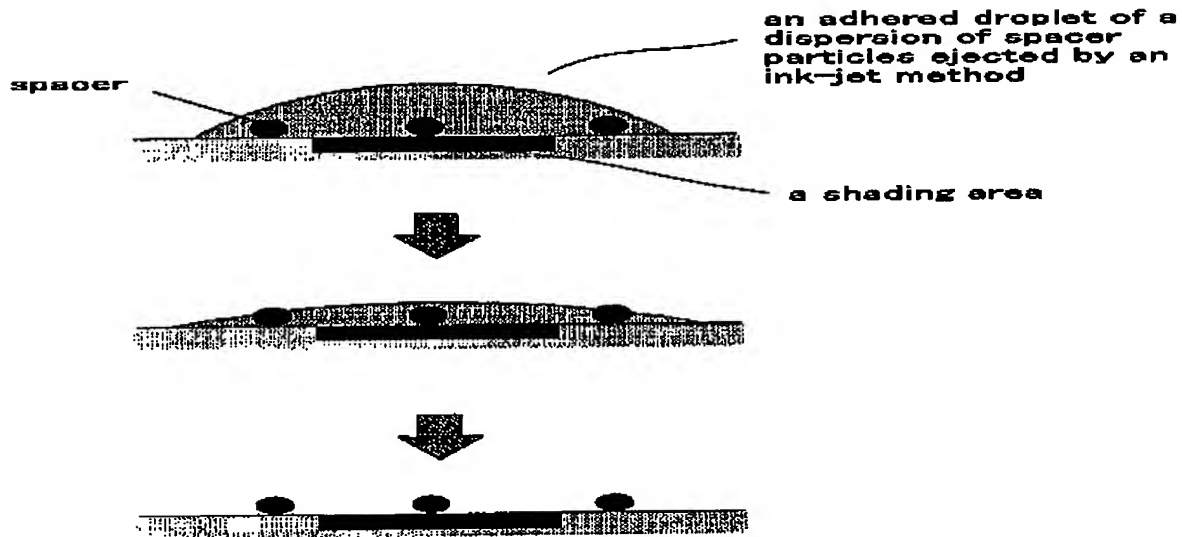
Response to rejection of claims 1-3, 11-13, and 20 under 35 U.S.C. § 102(b) based on Okabe

Independent claim 1 is directed toward a method for manufacturing a liquid crystal display wherein spacer particles are located at arbitrary positions on a substrate by ejecting a dispersion of spacer particles by an ink-jet method. The diameters D_1 and D_2 satisfy Equation (1): $D_2 < (D_1 \times 0.5)$ where D_1 represents the diameter of an adhered droplet of the dispersion of spacer particles, having adhered to said substrate; and D_2 represents an outside diameter of an

area to which the adhering spacer particles remaining after the said dispersion of spacer particles is evaporated adhere.

As background for the Examiner, when locating the spacer particle using an ink-jet printer, the first problem is that it is impossible to control the size of a droplet ejected by a ink-jet method so as to be smaller than a size of area on which spacers are to be located. Generally, the diameter of a droplet having adhered after a droplet ejected by a ink-jet method has adhered to the substrate is about 40 to 200 μm . However, in recent years, as more precise, downsized and diversified electronic equipment has been developed, high performance, such as a smaller displays and high contrasts, has been required for liquid crystal displays. Therefore, the width of a shading area on which spacer particles are located has become about 10 to 30 μm . Thus, it was very difficult to locate the spacer particles using an ink-jet printer, as can be seen in Figure A, below, which shows the state of the background art:

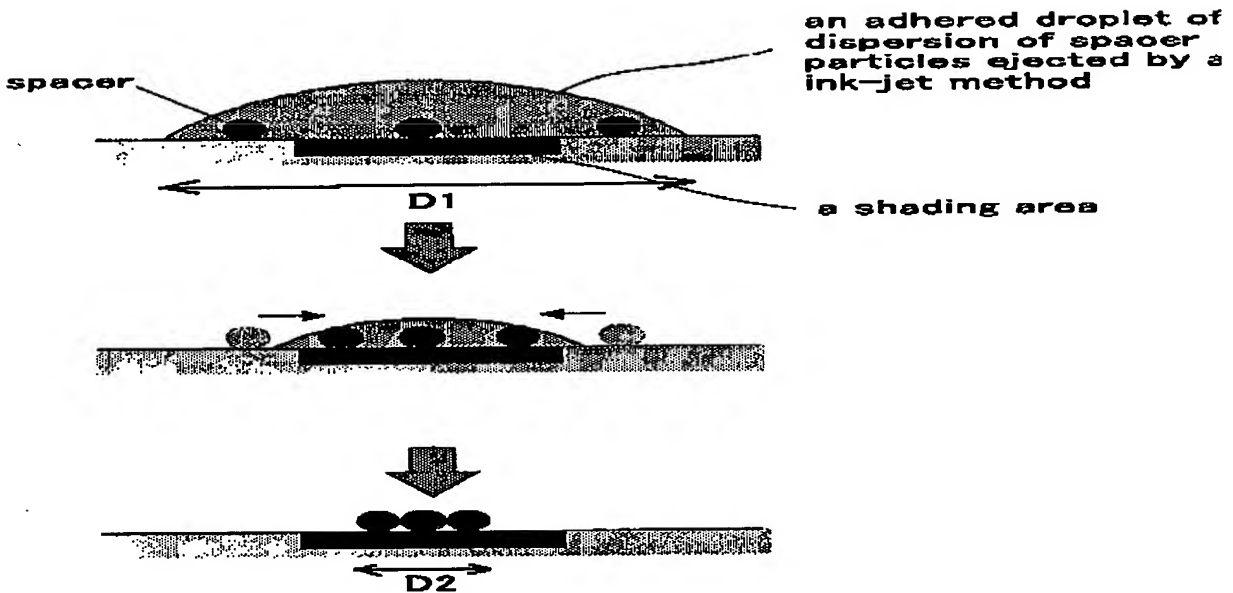
Figure A:



In Figure A, the diameter of a droplet having adhered after a droplet ejected by an ink-jet method is larger than the width of the shading area. Hence, the spacer particles are located outside of the shading area.

The method of present claim 1 allows for, after the dispersion of spacer particles has adhered to the substrate, the spacer particles in the dispersion of spacer particles to gather in the vicinity of a central portion of the droplet adhering in an evaporating process of the dispersion, as can be seen by Figure B, below:

Figure B:



Thus, by ejecting the dispersion of spacer particles as liquid droplets having a droplet diameter which can be formed and ejected by the ink-jet method by the ink-jet method, it becomes possible to locate spacer particles in a smaller area than the diameter of the liquid droplet.

Independent claim 11 is directed toward a dispersion of spacer particles which comprises spacer particles in which a vinyl-based thermoplastic resin, formed by free radical polymerizing vinyl-based monomers having a hydrophilic functional group or vinyl-based monomers having a hydrophilic functional group and an alkyl group having 3 to 22 carbon atoms, is combined with the surface of an inorganic fine particle and/or an organic fine particle by graft polymerization.

The dispersion further comprises a medium comprising water and/or a hydrophilic organic solvent, having a surface tension of 25 to 50 mN/m at 20°C. In addition, the spacer particles are dispersed in the form of a single particle in the medium.

Okabe relates to a method for discharging a viscous substance from a viscous substance dispenser and a method of forming patterns using the viscous substance dispenser.

Applicant respectfully submits that Okabe does not anticipate or render obvious claims 1-3, 11-13, and 20.

Independent claim 1, from which claims 2-3 depend, recites that the outside diameter, D₂, of the adhering spacer particles remaining after the dispersion of spacer particles is evaporated satisfies the relationship of Equation (1) in claim 1. Thus, the present claims recite that the dispersion of spacer particles is evaporated. The Office Action asserts that Okabe discloses that the diameter of spacer particles remaining after the dispersion is evaporated falls within Applicant's claimed range. Applicant respectfully disagrees.

As mentioned above, and also during the Interview, independent claim 1 recites the evaporation of the dispersion of spacer particles by which the above Equation (1) is obtained. In other words, the spacer particles are present within a dispersion prior to being deposited on a substrate. When deposited on a substrate, the dispersion medium evaporates, leaving the spacer

particles on the substrate which satisfy Equation (1). As discussed during the Interview, Okabe does not disclose such an evaporation step. Okabe does not disclose or teach that the viscous substance that it allegedly discloses undergoes an evaporative step, leaving behind spacer particles that satisfy Equation (1) of present claim 1. Therefore, Applicant respectfully submits that Okabe does not include this element of the present claims, and Okabe does not anticipate or render obvious independent claim 1 or any of the claims which depend from independent claim 1.

Applicant further respectfully submits that Okabe does not anticipate or render obvious independent claim 11 or the claims depending therefrom (claims 12-13 and 20 for the purposes of this rejection). As discussed during the interview, independent claim 11 recites, among other things, that (1) the spacer particles comprise a vinyl-based thermoplastic resin, formed by free radical polymerizing vinyl-based monomers having a hydrophilic functional group or vinyl-based monomers having a hydrophilic functional group and an alkyl group having 3 to 22 carbon atoms, that is (2) combined with the surface of an inorganic fine particle and/or an organic fine particle by graft polymerization.

As discussed during the Interview, Applicant respectfully submits that Okabe does not disclose the above elements of independent claim 11. First, Okabe does not disclose a vinyl-based thermoplastic resin formed by free radical polymerizing vinyl-based monomers having a hydrophilic functional group or vinyl-based monomers having a hydrophilic functional group

and an alkyl group having 3 to 22 carbon atoms. Second, there is no mention within Okabe that such a vinyl-based thermoplastic resin is combined with the surface of the particle by graft polymerization.

Applicant therefore respectfully submits that Okabe does not disclose or teach all of the elements of independent claim 11 (or claims 12-13 and 20, which depend from independent claim 11) because Okabe does not disclose or teach all elements present within the claim. Therefore, Applicant respectfully submits that Okabe does not anticipate or render obvious claims 11-13 and 20.

In view of the above, Applicant respectfully submits that Okabe does not anticipate or render obvious the present claims. Applicant respectfully requests reconsideration and withdrawal of this rejection.

Response to rejection of claims 7 and 10 under 35 U.S.C. § 102(b) based on Sakamoto

Independent claim 7 recites a substrate for a liquid crystal display. A color filter is formed, comprising a pixel area arrayed in accordance with a given pattern and a shading area defining the pixel area. In addition, an orientation layer is present, where θ_b is a contact angle relative to the dispersion of spacer particles in a pixel area. Further, an area is present in which θ_a is a contact angle relative to the dispersion of spacer particles in at least in a part of a shading area. θ_a and θ_b are claimed to satisfy a relationship expressed by Equation (2): $\theta_a < \theta_b$.

Sakamoto discloses an active matrix liquid-crystal display device, and the Office Action asserts that Figures 2(a) and 6(b) and Paragraph No. [0089] discloses the elements of independent claim 7.

As discussed during the Interview, it appears that the position set forth in the Office Action with respect to claim 7 was based upon a mistaken interpretation of the definitions of θ_a and θ_b . In response, Applicant has herein amended claim 7 to more clearly recite the definitions of θ_a and θ_b . Thus, θ_a relates to the contact angle between the dispersion of spacer particles and the orientation layer in a shaded area, whereas θ_b relates to the contact angle between the dispersion of spacer particles and the orientation layer in a pixel area.

It appears that the Office Action mistakenly interpreted both θ_a and θ_b to relate to the contact angle between the dispersion of spacer particles and the orientation layer in all areas (both pixel and shaded). In that respect, the Office Action asserted that Sakamoto disclosed the θ_a and θ_b of present claim 7. However, Applicant notes that Figures 2(a) and 6(b), to which the Office Action refers, do not disclose the pixel areas and shading areas recited in the claims.

Accordingly, because it is clear that the Office Action's definitions of θ_a and θ_b are not the definitions used within Applicant's claims, Applicant respectfully submits that the subject matter disclosed and taught by Sakamoto does not anticipate or render obvious the subject matter of Applicant's claim 7.

In view of the above, Applicant respectfully submits that Sakamoto does not anticipate or render obvious the subject matter of claims 7 or 10 (which depends from 7). Applicant accordingly respectfully requests reconsideration and withdrawal of this rejection.

Response to rejection of claims 4-6 and 14-19 under 35 U.S.C. § 103(a) based on Hirose in view of Okabe

The Office Action relied upon Hirose to provide those elements of claims 4-6 and 14-19 missing from Okabe, which is discussed above. Claims 4-6 and 14-19 each ultimately depend from independent claim 1, which is discussed above.

However, Applicant respectfully submits that Hirose does not provide those elements missing from Okabe, as Okabe is discussed above, and thus this combination of references does not anticipate or render obvious the subject matter of claims 4-6 and 14-19.

Applicant accordingly respectfully requests reconsideration and withdrawal of this rejection.

Response to rejection of claim 8 under 35 U.S.C. § 103(a) based on Sakamoto in view of Hirose

The Office Action relied upon Hirose to provide those elements of claim 8 missing from Sakamoto, which is discussed above. Claim 8 depends from independent claim 7, which is discussed above.

However, Applicant respectfully submits that Hirose does not provide those elements missing from Sakamoto, as Sakamoto is discussed above, and thus this combination of references does not anticipate or render obvious the subject matter of claim 8.

Applicant accordingly respectfully requests reconsideration and withdrawal of this rejection.

Response to rejection of claim 9 under 35 U.S.C. § 103(a) based on Sakamoto in view of Hirose, and further in view of Furukawa

The Office Action relied upon Furukawa to provide those elements of claim 9 missing from the combined teachings of Sakamoto and Hirose, discussed above. Claim 9 depends from independent claim 7, which is also discussed above.

However, Applicant respectfully submits that neither Hirose nor Furukawa provide those elements missing from Sakamoto, as Sakamoto is discussed above, and thus this combination of references does not anticipate or render obvious the subject matter of claim 9.

Applicant accordingly respectfully requests reconsideration and withdrawal of this rejection.

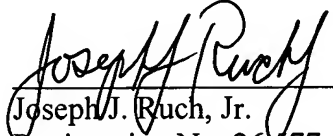
AMENDMENT UNDER 37 C.F.R. § 1.111
Appln. No. 10/508,859

Atty. Docket No. Q83325

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby earnestly solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the local Washington, DC, telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Joseph J. Ruch, Jr.
Registration No. 26,577

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

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CUSTOMER NUMBER

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